



UNITED STATES PATENT AND TRADEMARK OFFICE

AS
UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/630,680	08/01/2000	Shinichi Imai	819-405	7497

7590

01/30/2002

Eric J. Robinson
Nixon Peabody LLP
Suite 800
8180 Greensboro Drive
McLean, VA 22102

EXAMINER

AHMED, SHAMIM

ART UNIT

PAPER NUMBER

1746

DATE MAILED: 01/30/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/630,680

Applicant(s)

IMAI, SHINICHI

Examiner

Shamim Ahmed

Art Unit

1746

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 01 August 2000.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-18 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 01 August 2000 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 5.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

Art Unit: 1746

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 2,5,8,11,14 and 17 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In the above mentioned claims, it is not clear how the carbon to fluorine ratio is 0.5 or more in the gas C₃F₈ because the carbon to fluorine ratio for the gas is only 0.375.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Inazawa et al (5,595,627).

Inazawa et al disclose a plasma etching process, wherein a silicon dioxide layer is etched over a substrate using a fluorocarbon gas such as C₄F₈, the carbon to fluorine ratio is 0.5 (col.6, lines 44-54).

Inazawa et al also disclose that residence time of the processing gas is determined and

Art Unit: 1746

Controlled in a predetermined range. Further more, Inazawa et al teach that the value of the residence time dependence on the basis of the target value of the etching ratio (col.7, lines 18-25 and col.8, lines 14-24). Inazawa et al fail to teach the exact value of the residence time. However, it would have been obvious to one skill in the art at the time of claimed invention to optimize the specific time for the etching in order to maintain a proper etching section ratio, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233. ✓

As to claim 4, Inazawa et al teach that pressure of the processing chamber, flow rate of the fluorocarbon gas and the voltage is controlled by a controller section (col.8, lines 36-42). Inazawa et al remain silent about controlling $P \times w_0 / Q$ at $0.8 \times 10^4 \text{ sec.W/m}^3$ or less than $8 \times 10^4 \text{ sec.W/m}^3$. It would have been obvious to one skill in the art at the time of claimed invention to optimize the same for effective etching ratio, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

3. Claims 7-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nguyen et al (5,244,730).

Nguyen et al disclose a plasma process, wherein an organic film is deposited on a substrate by introducing a fluorocarbon gas of C_4F_8 in which a ratio of carbon to fluorine is more than 0.5 (col.2, lines 11-14, col.3, lines 37-49). Nguyen et al also disclose that pressure, flow rate and the residence time of the fluorocarbon gas is maintained at

Art Unit: 1746

about 0.9 seconds (col.3 lines 37-49 and col.4, lines 14-17), wherein the residence time is generally expressed by a simple equation: residence time = capacity of the processing chamber x pressure / supply rate of the processing gas, which is supported by Inazawa et al (col.7, lines 17-22 of the patent 5,595,627). As to claim 9, Nguyen et al teach that the pressure of the chamber is controlled by a pump and also the flow rate of the gas is controlled by a valve (col.4, lines 31-36 and lines 45-48). Nguyen et al fail to teach the residence time is controlled at 0.1 second or less. Examiner takes an official notice that it would have been obvious to one skill in the art at the time of claimed invention to optimize the residence time depending on a required thickness of the deposited film, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

By doing so, one could have better process control to achieve a desired coating on a substrate.

4. Claims 10-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nguyen et al (5,595,627).

Nguyen et al discussed above in paragraph No. 4 and also disclose that power density is of the process is typically maintain at the range of 0.05 to about 0.4 W per cm² along with the residence time (col.4, lines 49-59). Nguyen et al remain silent about controlling $P \times w_0 / Q$ at 0.8×10^4 sec.W/m³. It would have been obvious to one skill in the art at the time of claimed invention to optimize the same for efficient controlling the deposition rate, since it has been held that where the general conditions of a claim are disclosed in

Art Unit: 1746

the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

5. Claims 13-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Inazawa et al 95,595,627) and Yanagida (5,338,399) and further in view of Laermer et al (5,501,893).

Inazawa et al, modified with Yanagida discussed above in paragraph No.6 and Yanagida also disclose that a deposition gas is used simultaneously after the etching for further improving selectivity against the underlying silicon layer (col.3, lines 12-15) but fail to explicitly teach that the introduction of a second plasma for depositing an organic film on the etched silicon dioxide film.

However, Laermer et al disclose a process, wherein alternately etching and depositing steps are performed for providing a high mask selectivity simultaneous with a very high anisotropy of the etched structure (see the abstract, col.4, lines 33-37, col.5, lines 55-60 and col.6, lines 11-20).

As to the first and second residence time of claims 13,16 and 18, Laermer et al teach an alternating etching and depositing steps but remain silent about the process times.

Examiner takes an official notice that it would have been obvious to one skill in the art to have one residence time for the etching step and another residence time for the depositing or the polymerization step because two different process must have two different process times and correspondingly must have two different PxW/Q .

Therefore, it would have been obvious to one skill in the art at the time of claimed invention to combine Laermer et al's teaching into modified Inazawa et al's method for

Art Unit: 1746

providing a high mask selectivity simultaneous with a very high anisotropy of the etched structure as taught by Laermer et al.

Conclusion

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Koshiishi (5,928,963) discloses a plasma etching process, wherein the residence time is controlled; Ephrath (4,283,249) discloses a reactive ion etching process for silicon oxide film, wherein the residence time is controlled with in less than 2 seconds.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shamim Ahmed whose telephone number is (703) 305-1929. The examiner can normally be reached on M-Thu (7:00-5:30) Every Friday Off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Randy Gulakowski can be reached on (703) 308-4333. The fax phone numbers for the organization where this application or proceeding is assigned are (703)-305-7718 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

ALEXANDER MARNOFF
PRIMARY EXAMINER



SA
January 28, 2002